Sales of Fuel Oil and Kerosene in 2001

Total distillate sales increased for the tenth consecutive year to reach an all-time high of 59.9 billion gallons. That simple statement could lead to the conclusion that distillate fuel oil sales were largely unaffected by the slowdown in the economy, the mild winter, and the tragic events of September 11, 2001. However, the underlying reality differs considerably from such an optimistic view. Even though total sales did increase, both the magnitude of the increase (310 million gallons) and the percent change (0.52 percent) were the smallest of the past decade.

Sales of residual fuel oil, buoyed by substantial fuel switching during the first several months of the year, increased by nearly 400 million gallons (3.0 percent) to a total of 13.6 billion gallons, the highest level of sales since 1998. Because of the unusual circumstances in fuel switching, the increase only temporarily reversed the long-term downward trend in demand for residual fuel oil. The increase in sales during 2001 constitutes the first increase in sales and the highest total amount of residual fuel oil since 1998. Total sales of kerosene increased for the first time in three years. Sales rose by nearly 73 million gallons (7.0 percent) from the level set in 2000.

As a consequence of the relatively small increase in distillate sales combined with sizable increases in the sales of residual fuel oil and kerosene, distillate sales accounted for a slightly smaller share of the overall fuel oil market in 2001 (80.3 percent) as compared to 2000 (80.7 percent). The shift in the proportion of total fuel oil sales is the first time since 1998 that distillate sales did not gain as a percent of total sales. Residual fuel oil sales rose to 18.2 percent of total fuel oil sales. Kerosene accounted for the remaining 1.5 percent of total sales.

Distillate Fuel Oil

As they have done for the past decade, beginning in 1992, sales of distillates surpassed the previous all-time high set the preceding year. However, the magnitude of the increase was the smallest of the past decade and represented 19.4 percent of the average increase of the previous 9 years and only about 15.3 percent of the increase during 2000.[1] Although a number of factors influenced the sales of distillate fuels, three forces in particular combined to restrain sales.

Table HL1. Volume Distribution of Distillate and Residual Fuel Oils, 2000 and 2001

Energy Use	Distillate 2001		Distillate 2000		Residual 2001		Residual 2000	
	Volume (million gallons)	Percent Share	Volume (million gallons)	Percent Share	Volume (million gallons)	Percent Share	Volume (million gallons)	Percent Share
Residential	6,643	11.1	6,830	11.5	—	—	—	—
Commercial	3,718	6.2	3,706	6.2	648	4.8	664	5.0
Industrial	2,466	4.1	2,331	3.9	1,747	12.8	1,585	12.0
Oil Company	748	1.2	686	1.2	132	1.0	154	1.2
Farm	3,584	6.0	3,455	5.8	—	—	—	—
Electric Power	1,344	2.2	1,015	1.7	5,647	41.5	4,363	33.0
Railroad	3,040	5.1	3,291	5.5	—	—	—	—
Vessel Bunkering	2,044	3.4	2,261	3.8	5,409	39.7	6,410	48.5
On-Highway	33,215	55.4	33,130	55.6	—	—	—	—
Military	401	0.7	306	0.5	20	0.1	28	0.2
Off-Highway	2,708	4.5	2,589	4.3	—	—	—	—
Other	0	0.0	0	0.0	5	0.0	7	0.1
Total	60,120		59,601		13,609		13,211	

Notes: Totals may not equal sum of components due to independent rounding.
Sources: Energy Information Administration, Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report,"2000 and 2001.

[1]The average increase during the period 1992-2000 was 1.6 billion gallons. Distillate sales increased by more than 2.0 billion gallons in 1999 and 2000.

First, the winter in 2001 was both milder than the winter of 2000 and milder than average. The winter as measured by heating degree-days[2] was 5.3 percent warmer than the winter of 2000 and 7.7 percent warmer than normal. Only in the West was the winter slightly colder than the year before and even there, the winter was still warmer than average. The winter in the northeast section of the country, where most of the home heating oil is consumed, was considerably warmer than normal and consequently, sales to the residential sector were down 2.7 percent or more than 187 million gallons compared to 2000.

Second, the slowdown in the economy negatively affected energy demand in general. Total energy consumption in the United States declined by 2.3 percent from 98.775 quads to 96.517 quads during the year.[3] The overall decline was partially offset by fuel switching that resulted from the unusually high natural gas prices during the first several months of 2001. The large price differences between natural gas and oil products gave customers with the ability to fuel switch the opportunity to curtail consumption of natural gas, and to switch to oil for heat, industrial processing and electric power generation. Distillate sales to the industrial and electric power sectors increased as users acquired distillate for use in place of natural gas or to blend with residual fuel oil to improve residual fuel quality. (Please see the following discussion on residual fuel oil for details.)

Third, the aftermath of the terrorist attacks on September 11, 2001 combined with the downturn in the economy to reduce demand for distillate fuels in the transportation sector. Although sales of on-highway diesel increased, the magnitude of the increase was far smaller than typical and was more than offset by declining sales of bunker fuel and to the railroads.

Aside from the immediate and profound impact of the events of September 11, 2001 on airline transportation fuels which are not discussed in this report, the impact of those tragic events on fuel use by other modes of transportation and in other sectors of the economy are more difficult to measure. Monthly data collected by the Bureau of Transportation Statistics show that declines in year-to-year comparisons of the vehicle miles traveled (VMT) took place during four months in 2001. Although the data confirm that VMT fell in September, they also show that the other three monthly declines took place during the first half of the year, thus indicating the weakened state of the economy. Reflecting the precipitous decline in air travel following the attacks, VMT correspondingly increased by 2.7 percent during the fourth quarter and by 4.2 percent for the month of December, the largest monthly increase since November 1999.[4]

Unlike 2000, when distillate sales benefited from a robust national economy, economic slowed considerably during 2001. Gross domestic product (GDP) increased by only 1.2 percent compared to a gain of 4.1 percent in 2000, and unemployment rose from 4.0 percent to 4.8 percent.[5]

Sales of distillate fuels to the transportation sector continued to dominate overall distillate fuel oil sales increase in the 4th quarter of 2001. However, as a result of declines in the sales of distillates for use as bunker fuel and in railroads, and the small increase in sales of on-highway diesel fuel, sales to the transportation sector accounted for approximately 64 percent of total distillate sales compared to about 65 percent in 2000. Although sales of on-highway diesel increased by nearly 86 million gallons, that small increase (0.3 percent) was less than one tenth the size of the increase of the previous year and was overshadowed by declines in sales of bunker fuel and sales to railroads. Sales of railroad diesel slipped by more than 250 million gallons (7.6 percent) and sales of distillate bunker fuels dropped by 217 million gallons (9.6 percent).

Sales to the residential sector were adversely affected by milder than normal winter conditions. Although the winter was only 5.3 percent warmer than that of the previous year, temperatures in the North East, Middle Atlantic and the upper Midwest, were all considerably higher than was the case in 2000 and higher

[2]For heating and cooling purposes, records are kept on a daily basis determining the "degree-days." Degree-days are a measure of the difference between the average of the high and low temperatures for a given location and 65 degrees F. If the average temperature is less than 65 F, the resulting difference is the heating degree-days (an average temperature of 60 results in 5 heating degree-days). If the average temperature exceeds 65 degrees, the resulting difference is the cooling degree-days (an average temperature of 70 results in 5 cooling degree-days). Degree-days are accumulated over the course of a year (heating degree-days from July through June and cooling degree-days from January through December) to provide a measure against which fuel providers, utilities, and other energy users can plan for coming needs.

[3]One quad equals one quadrillion (a one followed by fifteen zeros) British thermal units (Btu), source EIA, *MER May 2002*, Table 2.1

[4]Federal Highway Administration, Annual Vehicle Distance Traveled in Miles and Related Data 2001 Table VM-1, *and Traffic Volume Trends, April 2002,*Table 1 & 9B

[5]*Economic Indicators,* April 2002, Washington D.C. U.S. government Printing Office, p 12.

still than normal. Seasonal averages ranged from nearly 7 to more than 9 percent warmer than normal.[6] Consequently, heating oil use fell by more than 187 million gallons (2.7 percent).

The relative weakness of the economy, coupled with the milder than normal winter also affected growth of distillate sales to the commercial sector of the market. Although sales to that sector did increase, the amount of the increase was only about 0.3 percent compared to increases of 11.0 percent in 2000 and 3.2 percent in 1999.

Despite a decline in overall energy use in the industrial sector, sales of distillate fuel oil to industrial consumers and for electric power generation showed robust increases. Sales to the industrial sector increased by more than 135 million gallons (5.8 percent) and sales to utilities surged, increasing by more than 328 million gallons (an increase of 32.4 percent).

Both the apparent contradiction in the industrial sector and the sharp upturn in the electric power sector are in large measure an indirect result of unusually high natural gas prices during the final weeks of 2000 and during much of the first half of 2001. The differential between the price of natural gas and that of residual fuel oil resulted in significant switching from natural gas to oil particularly during the period beginning in December 2000 and lasting into March 2001. While the greatest impact was on residual fuel oil (see the following section on residual fuel oil for details) distillate No. 2 was also in demand to blend with residual fuel oil as cutter stock to upgrade poor quality high viscous product, to blend to lower sulfur content and reduce emissions, and even for some short-term use in peaking units.

In 2001, weather, the ever present and most dominant factor in agriculture, favored some crops to the extent that new records and near record harvests were achieved. The largest soybean crop and the fourth largest corn crop in history helped overcome the poor wheat harvest and propel distillate sales to the agriculture sector to the highest level since 1996 increasing by 129 million gallons (3.7 percent).[7]

Offsetting the slowing of the economy and the growth in unemployment, low interest rates contributed to robust growth in residential construction, new housing starts, and other construction in the private sector, more than offset declining construction in the commercial sector. Sales to the off-highway and the construction sector also benefited from the number of highway projects undertaken during the course of the year and consequently, sales to the off-highway and construction sector increased by 119 million gallons (4.6 percent).

Oil company direct use of distillate fuel oil increased sharply for the second consecutive year as companies responded to higher prices by increasing exploration, development and other activities requiring fuel usage. One measure of the increased activity is the number of drilling rigs in operation, and driven by the improved crude oil prices and sharply higher natural gas prices during the first several months of the year, the monthly average number of rotary rigs in operation during 2001 was 1,497 an increase of 18.9 percent. The increase in drilling rigs helped boost distillate fuel oil for direct oil company use by more than 61 million gallons (8.9 percent). However, despite the impressive increase for the year as a whole, most of the additional use of oil, (as measured by the number of drilling rigs) took place during the first half of the year. As prices moderated, rig counts fell from a high of 1,698 reached in February to 1,164 in December.[8]

On a regional basis, the warmer than normal winter contributed to declining sales of home heating oil. Consequently, distillate sales to the residential sector decreased throughout PAD District I, II and IV.[9] Sales in PAD District I, (the Atlantic Coast) fell the most, decreasing by nearly 151 million gallons (2.6 percent). Sales of home heating oil fell throughout the region, falling by 18 million gallons in New England, 89 million gallons in the Middle Atlantic region, and 43 million gallons in the southern portion of the region. Sales in PAD District II fell approximately 45 million gallons and sales in PAD District IV (the Rocky Mountains) were down slightly by 2 million gallons. Sales increased in PAD District III (the Gulf Coast) and PAD District V (the Pacific Coast). However, the increases of 1 million gallons in PAD District III and 10 million

[6]In New England 6.2 percent warmer than 2000 and 8.5 percent warmer than normal; in the Middle Atlantic, 8.3 percent warmer than 2000 and 9.3 percent warmer than normal; in the East North Central, 7.3 percent warmer than 2000 and 9.3 percent warmer than normal; in the West North Central 4.2 percent warmer than 2000 and 6.8 percent warmer than normal. Source National Climate Data Center.

[7]Department of Agriculture, National Agricultural Statistics Service, *Statistical Highlights 2001: Overview, U.S. Crop Summary, p 4-5.*

[8]Baker Hughes, North American Rig Counts, U.S. Annual Averages by State 1987-2001, (http://www.bakerhughes.com/investor/rig/rig_na.htm). See also, EIA *Monthly Energy Review*, Table 5.1.

[9]The U.S. is divided into 5 Petroleum Administration for Defense Districts (PAD Districts). District I, East Coast, District II, Midwest, District III, Gulf Coast, District IV, Rocky Mountains, and District V, Pacific Coast. PAD District I is broken into three subdivisions: Subdistrict IA, New England, Subdistrict IB, Middle Atlantic, and Subdistrict IC, Southeast.

gallons in PAD District V were small in comparison to the magnitude of the loss in sales elsewhere.

Nationally, sales to the commercial sector increased slightly, up 11 million gallons (0.3 percent). Although sales increased in most areas of the country, in the New England section of PAD District I and in PAD District III sales dropped. To some extent, the declines reflect the warmer than normal winter, and to some extent changing fuel use patterns.

Overall sales of distillate to the industrial sector increased by 5.8 percent despite declines in industrial production, as mentioned above, this apparent contradiction results from increased sales of both distillate and residual fuel oils as industrial consumers switched from high priced natural gas to oil for much of the first half of the year. With the exception of PAD District III, (the Gulf Coast,) sales of distillate increased throughout the U.S. Sales increased most in the Southeastern section of PAD District I, in Pad District II, and in PAD District IV, the Rocky Mountain states.

Distillate sales to the military increased sharply during 2001. Sales increased by nearly one-third (96 million gallons). However, on a regional basis sales results were mixed. Sales decreased in PAD District II and the Middle Atlantic and Southeastern portions of PAD District I. Although sales increased in the Northeastern section of PAD District I, and in PAD Districts III, IV, and V, by far the largest increase took place in PAD District III along the Gulf Coast where sales increased by more than 97 million gallons.

Sales to the agricultural sector increased for the U.S. as a whole by 3.7 percent. Although increases in some of the principal crop-raising states were small, and in a few of the farm States declined somewhat, nonetheless sales of distillates for agricultural uses in the principal crop-raising sector of the country, PAD District II, were up nearly 93 million gallons (5.4 percent). Elsewhere, sales either rose or fell by relatively small amounts. Sales increased somewhat in New England, substantially more in the Southeast and slightly in the Gulf Coast. Sales fell in the Middle Atlantic and Rocky Mountains, and were essentially unchanged in the Pacific region.

Distillate sales to the electric power sector surged in 2001 as electric power producers reacted to exceptionally high prices of natural gas in late 2000 and through the first half of 2001 to make unusually heavy purchases of fuel oil as they switched to oil from natural gas. Sales of distillate were used to blend with residual fuel oil either to lower sulfur content in order to meet emission standards, to upgrade low quality fuel oil by improving viscosity, or to use as peaking fuel. Although sales increased sharply throughout the five PAD Districts, including the three sub-regions of PAD District I, demand increased the most in the Southeastern portion of PAD District I and along the Gulf Coast in PAD District III.

Residual Fuel Oil

For over a decade, a number of factors have contributed to a sustained and general decline in the production of and demand for residual fuel oil. Among the principle reasons are: changing crude oil specifications, increased refinery sophistication resulting in increased production of gasoline and distillate while reducing the capacity to refine heavy fuel oil, environmental constraints and restrictions on fuel oil use, and availability of abundant relatively inexpensive natural gas.[10]

In apparent contradiction to the long-term trend of decline, total sales of residual fuel oil increased during 2001. However, a close examination of the data for 2001 leads to the conclusion that sales increased as the result of unusual circumstances in the market, not a reversal of the long-term downward trend. As mentioned above, the unprecedented level of prices for natural gas led to a surge of demand in the industrial and electric power sectors of sufficient magnitude to overcome losses in other areas of the market and result in an overall gain for residual fuels sales in general.

With the exception of sales to the industrial and electric power sectors, the downward trend in residual fuel oil continued. Nonetheless, sales increases in those two sectors were of such magnitude that despite losses in other sectors totaling more than 1 billion gallons, overall sales of residual fuel oil increased by more than 398 million gallons (3.0 percent). The total of 13.6 billion gallons was the largest since 1998 when sales to the electric power sector were also unusually high.

[10]Due to the divestiture of many generation facilities, changes in fuel use and plant operations also contributed to the decline of residual fuel oil. For example, operators of these merchant plants blend fuels to achieve greater efficiency and to lower emissions of dirtier fuels (oil blended with natural gas and even oil and coal). When it is advantageous, the operators also may purchase power rather than generate electricity and re-sell the fuel.

Over the past several years, sales of residual fuel oil have fluctuated widely in response to weather, prices of competing fuels, changing practices in the electric power sector, and environmental constraints.[11] In 2001, the primary reason for the increase in sales came about earlier in the year when natural gas prices soared and led to a resurgence of residual fuel oil demand as industrial consumers and electric power generators with the ability to use residual fuel oil switched from natural gas to fuel oil in large numbers. The prolonged period of higher natural gas prices opened a window of opportunity for residual fuel to compete favorably and it resulted in as much as 200,000 barrels per day (b/d) of fuel switching.

Sales to the industrial sector increased throughout the U.S. except in the Southeast region of PAD District I, where sales dropped slightly (by 2.0 percent). The largest increase in industrial sales occurred in the New England region of PAD District I where sales increased by one third (nearly 119 million gallons.)

With the exception of the New England region of PAD District I, sales to the electric power sector increased throughout the country. By far, the largest increases in sales for electric power generation occurred in the Mid Atlantic and Southeast sub-districts of PAD District I. Sales surged by 424 million gallons (48.2 percent) in the Mid Atlantic, and by 399 million gallons in the Southeast. Natural gas prices reached the highest levels in the West in PAD District V as the power crisis gripped California. Electric generation was pushed to its limits. Anecdotal evidence points to residual fuel oil being delivered to California, and Arizona by rail from the Gulf Coast, by ship from the Orient, and even by truck to supply fuel to plants because of constraints on the supply of natural gas and in efforts to control costs. Consequently, sales of residual fuel oil to the electric power sector in PAD District V increased by 100 million gallons (22.6 percent).[12]

The increase in total sales of residual fuel oil, dominated by sales for the electric power sector, should be viewed in the context of the long-term decline in sales that resulted in a drop in sales of approximately 40 percent between 1987 and 2000. Unusual conditions such as extremes of weather or price volatility of fuel oil, natural gas, or other competing fuels may result in significant short-term increases.[13] These increases may occur in regional or even national sales of residual fuel to the electric power market in any given year; for example those that occurred in 2001 or earlier in 1998 are aberrations and are unlikely to be sustained even in the near-term.[14] Nationally, as new power plants come on line, most will be gas fired reducing demand for residual fuel oil.

Unlike the upturn in sales that occurred during 2001, the drop in sales of residual fuel oil during 2000 fits the well-established long-term trend of declining sales of residual fuel oil. Overall, sales of residual fuel will continue to shrink, as new supplies of natural gas such as Sable Island take away sales. Nonetheless, residual fuel oil will likely remain an important niche market, serving as back-up fuel, blending stock, safety valve, and hedging tool in the electric power market.

Although sales for direct use by oil companies fell by 13.9 percent nationally, that figure is somewhat misleading. Sales were actually up in PAD Districts I and II, but plunged in PAD District V. Although not often viewed as a major oil production center, California ranks fourth in national oil production. Much of the oil is low gravity, highly viscous and requires steam flooding for maximum production. The California electricity crisis not only curtailed refinery production and pipeline deliveries, but also adversely affected the amount of power available for steam production and hence crude oil production.[15]

With the exceptions of PAD Districts II and V, sales of bunker fuel appear to have dropped sharply, plunging by just over 1 billion gallons (15.6) percent). However, the apparent drop in sales results from reporting errors in the past that included sales for resale along with actual bunker sales data.

[11]In 1998, sales to electric utilities surged by more than 1.8 billion gallons driven by the unusually low prices and reduced hydroelectric power generation. Initially in 1999, the build-up of storage that resulted from the unusually heavy purchases by utilities especially late in 1998 dampened demand. Demand was further curtailed as the result of both another warmer than normal winter and a summer that while warmer than normal, was considerably milder in most areas of the country than the summer of 1998 and thus reduced the demand to meet summer peaks.

[12]Stringent emission and fuel quality specifications in effect in California make the burning of residual fuel oil particularly difficult. Utilities sold off most of their inventories of residual fuel oil before the end of the 1990s. Consequently, product had to be transported to plants in the region that had dual fuel capabilities.

[13]For example, the outage of several nuclear plants that boosted sales in the New England regional market in 1997.

[14] For example, the window of opportunity for fuel switching was at its peak from December 2000 through March 2001. Thereafter, the price differential narrowed considerably through the second quarter and with the exception of high sulfur fuel was essentially closed by the end of June. By midsummer, the price differential between natural gas and residual fuel oil had reversed to once again favor natural gas over oil.

[15]See *Platt's Oil Price Report,* Volume 79 various issues.

Overall, total sales to the commercial sector declined by 16 million gallons (2.5 percent). However, on a regional basis, sales fell only in portions of PAD District I; in the New England, sales fell by 28 million gallons (24.5 percent) and in the Middle Atlantic 9 million gallons (1.9 percent).

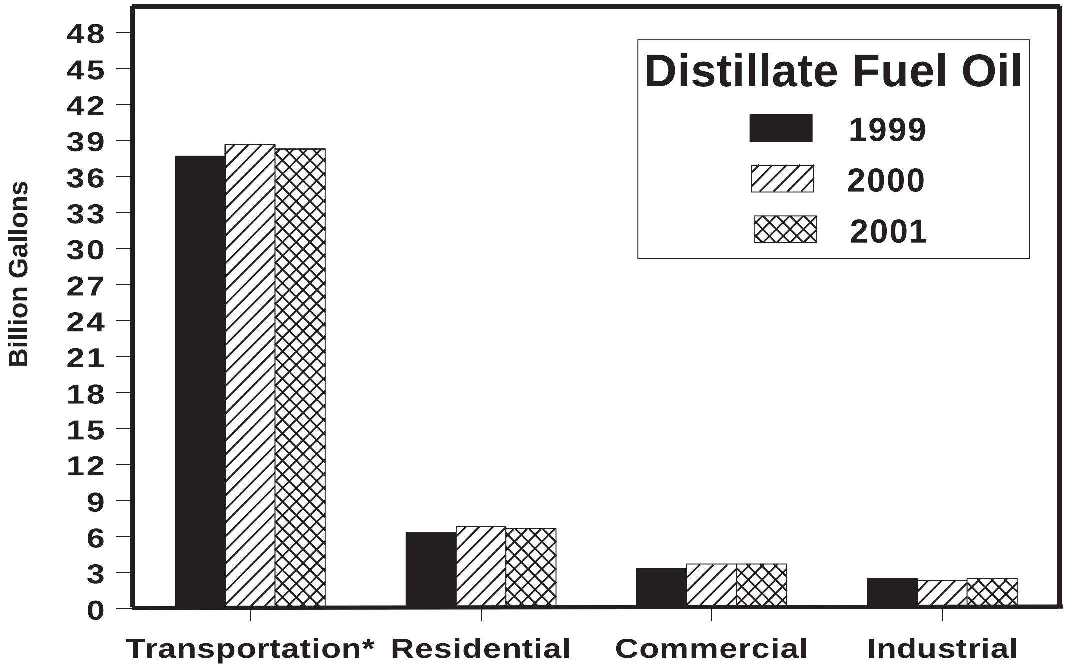
The downward trend in sales of residual fuel oil to the military continued during 2001.[16] On a regional basis, sales fell in PAD District III, PAD District V, and the New England and southern portion of PAD District I. Sales increased slightly in the Middle Atlantic portion of PAD District I and more sharply in PAD Districts II and V.

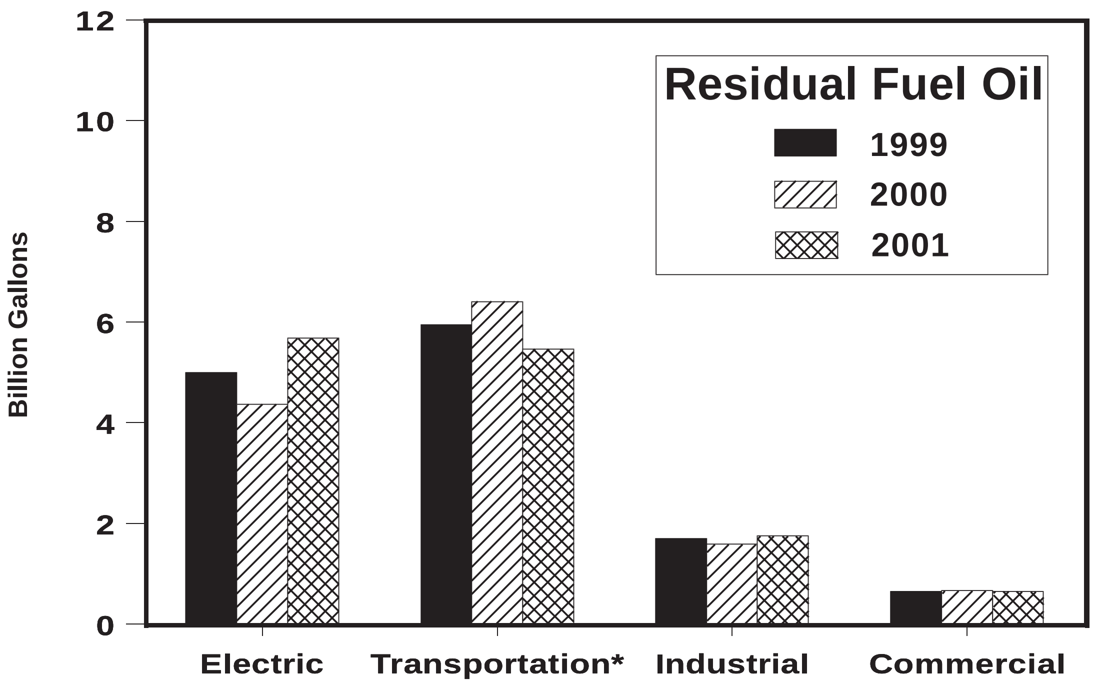
Kerosene

Reversing the declines of both 2000 and 1999, kerosene sales increased gaining 7.0 percent or 72.9 million gallons to reach a total of 1.1 billion gallons. Despite such a sizeable increase, total sales of kerosene remained well below the peak level of 1.2 billion gallons reached in 1999. For the first time since 1998, sales of kerosene increased in all major sectors. Sales to the industrial sector increased the most, by approximately 62.5 percent or 54 million gallons. Sales to the commercial sector increased by 6.0 percent or more than 13 million gallons. The next largest increase of 17.5 percent or 4 million gallons occurred in the farm sector and was followed by an increase of 3 million gallons in the residential sector.

[16] Since 1997, sales have fallen by nearly 37 percent.

Figure HL1. U.S. Sales of Distillate and Residual Fuel Oils by Energy Use, 1999-2001

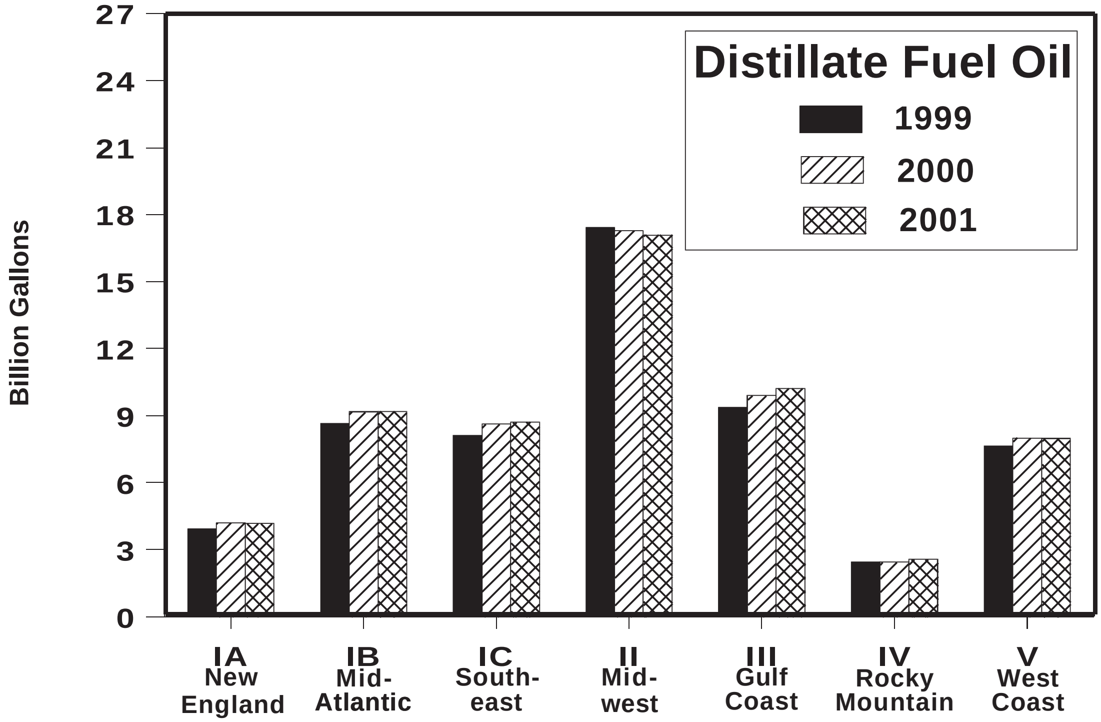


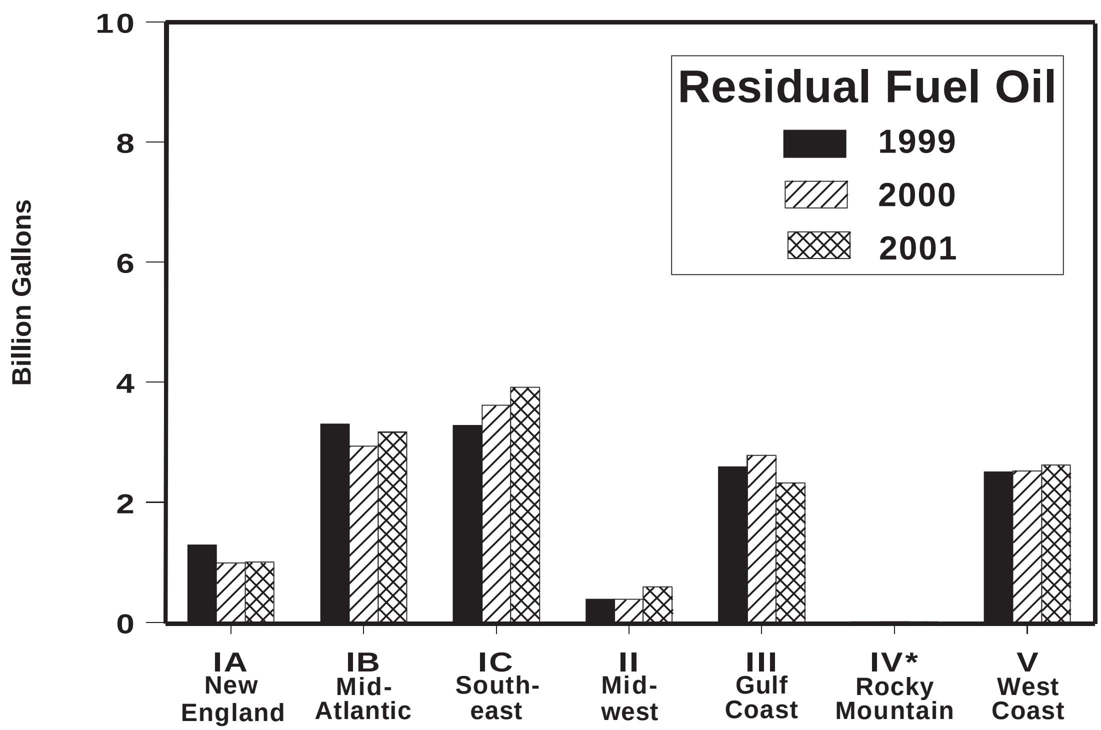


*For distillate fuel oil, transportation use comprises railroad, vessel bunkering, and on-highway diesel energy use categories. For residual fuel oil, transportation use comprises the vessel bunkering energy use category.

Sources: Energy Information Administration, Form EIA-821, "Fuel Oil and Kerosene Sales Report," 2000 and 2001.

Figure HL2. Volume Distribution of Distillate and Residual Fuel Oils by PAD District, 1999-2001

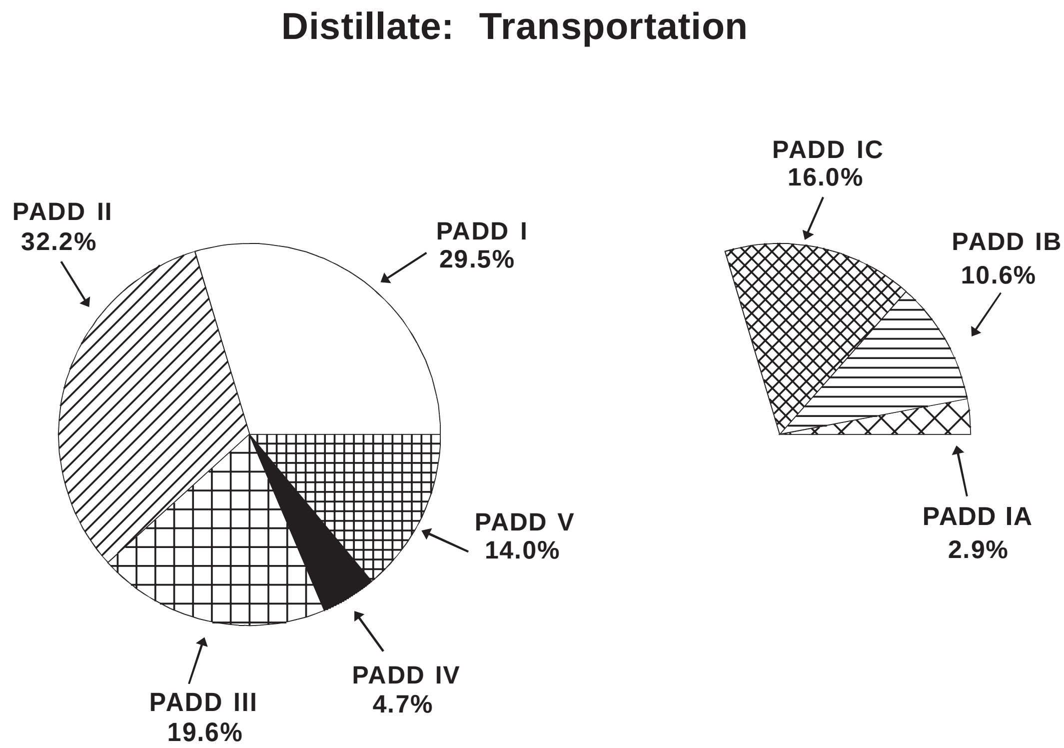


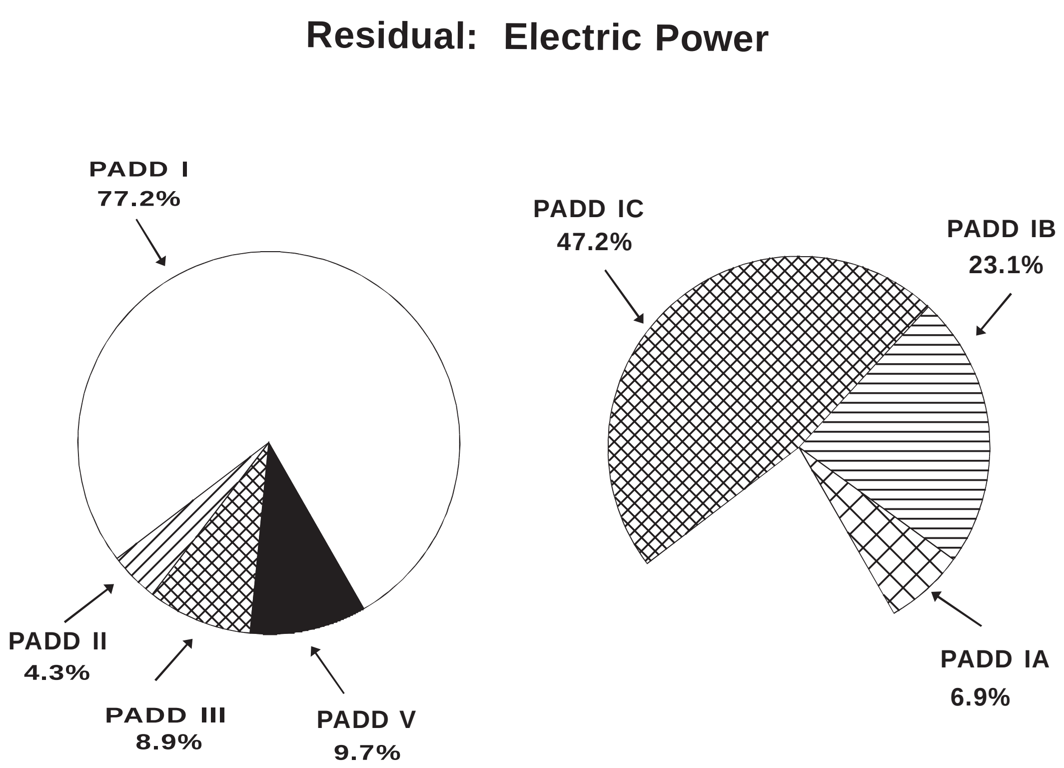


*Residual fuel oil sales in PAD District IV are too small to appear in this graph.

Sources: Energy Information Administration, Form EIA-821, “Fuel Oil and Kerosene Sales Report,” 2000 and 2001.

Figure HL3. Distillate and Residual Fuel Oil Sales for Selected Energy Use Categories by PAD District, 2001





Sources: Energy Information Administration, Form EIA-821, "Fuel Oil and Kerosene Sales Report," 2001.